US006055801A

United States Patent [19]

Stahlecker

[11] **Patent Number: 6,055,801**

[45] **Date of Patent: May 2, 2000**

[54] **PROCESS FOR MODERNIZING AN OPEN-END SPINNING MACHINE**

[75] Inventor: **Fritz Stahlecker**, Josef-Neidhart-Strasse 18, 73337 Bad Überkingen, Germany

[73] Assignees: **Fritz Stahlecker**; **Hans Stahlecker**, both of Germany

[21] Appl. No.: **08/741,769**

[22] Filed: **Nov. 5, 1996**

[51] **Int. Cl.**[7] **D01H 4/00**

[52] **U.S. Cl.** **57/406**; 57/301; 57/404; 57/408

[58] **Field of Search** 57/301, 404, 406, 57/407, 408, 411

[56] **References Cited**

U.S. PATENT DOCUMENTS

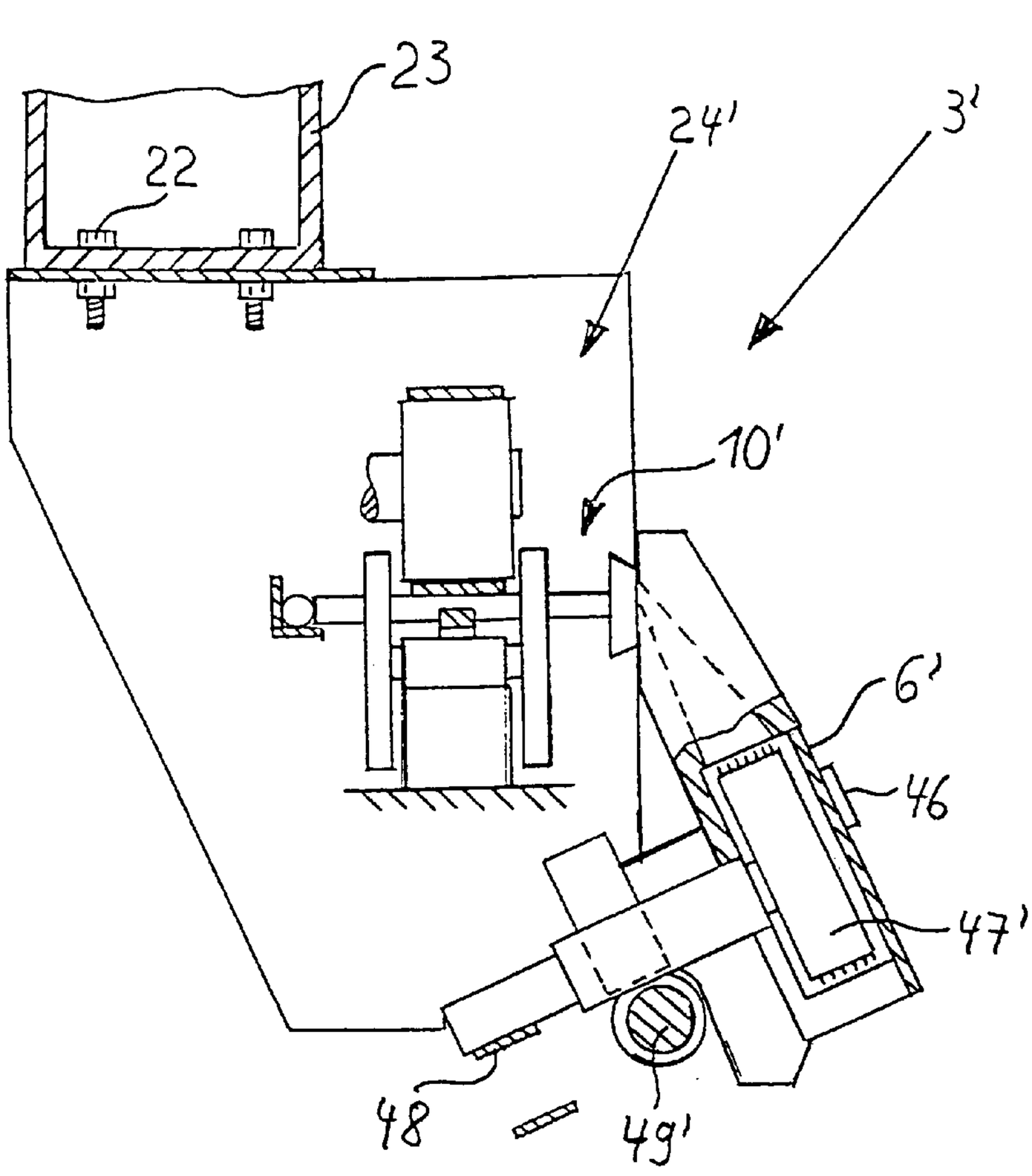
3,375,649	4/1968	Bures et al.	57/407
3,807,157	4/1974	Stahlecker	57/407
3,868,815	3/1975	Stahlecker	57/406
4,150,462	4/1979	Griesinger et al.	57/315
4,201,037	5/1980	Artzt et al.	57/301
4,204,391	5/1980	Clayton et al.	57/406
4,246,745	1/1981	Rehm et al.	57/408
4,387,558	6/1983	Rehm et al.	57/408
4,703,616	11/1987	Feuchter et al.	57/406
4,763,469	8/1988	Stahlecker et al.	57/401
4,866,925	9/1989	Stahlecker et al.	57/301
4,976,099	12/1990	Brockmanns et al.	57/301
5,185,994	2/1993	Stahlecker	57/412
5,398,494	3/1995	Wassenhoven et al.	57/408
5,433,068	7/1995	Stahlecker	57/407
5,471,829	12/1995	Billner	57/413
5,595,058	1/1997	Billner	57/413
5,611,195	3/1997	Lovas et al.	57/411
5,809,766	9/1998	Stahlecker	57/408

Primary Examiner—William Stryjewski
Attorney, Agent, or Firm—Evenson, McKeown, Edwards & Lenahan, P.L.L.C.

[57] **ABSTRACT**

An open-end spinning machine comprises a plurality of adjacently arranged spinning aggregates. Each spinning aggregate consists essentially of a rotor unit comprising a spinning rotor, and an opening unit for opening a fed sliver into single fibers. The opening unit and the rotor unit each comprise a plurality of components. In order to modernize the open-end spinning machine, at least one of the above mentioned components is replaced by at least one modernized component in such a way that the efficiency of the spinning aggregate is improved.

20 Claims, 5 Drawing Sheets



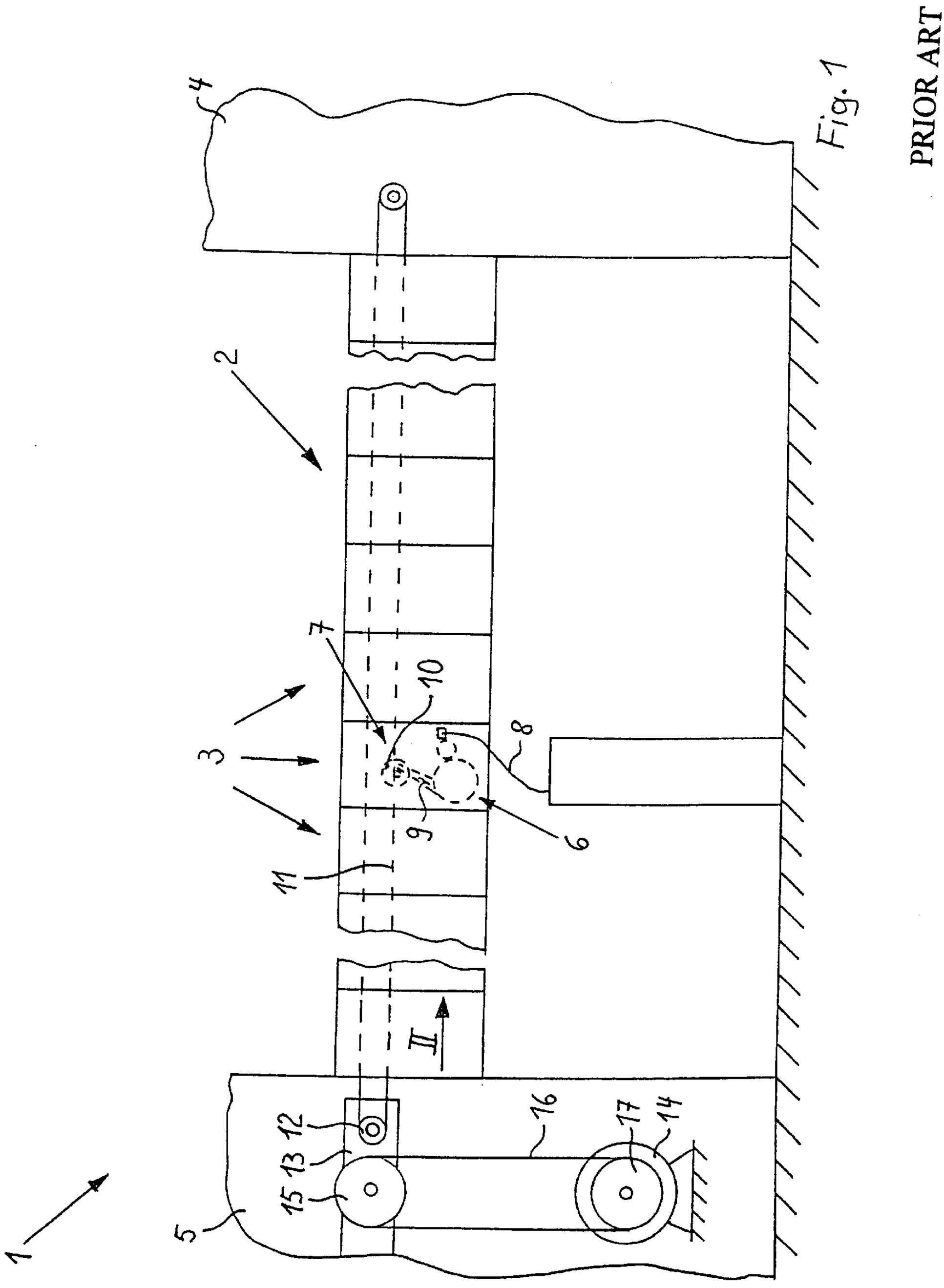


Fig. 1
PRIOR ART

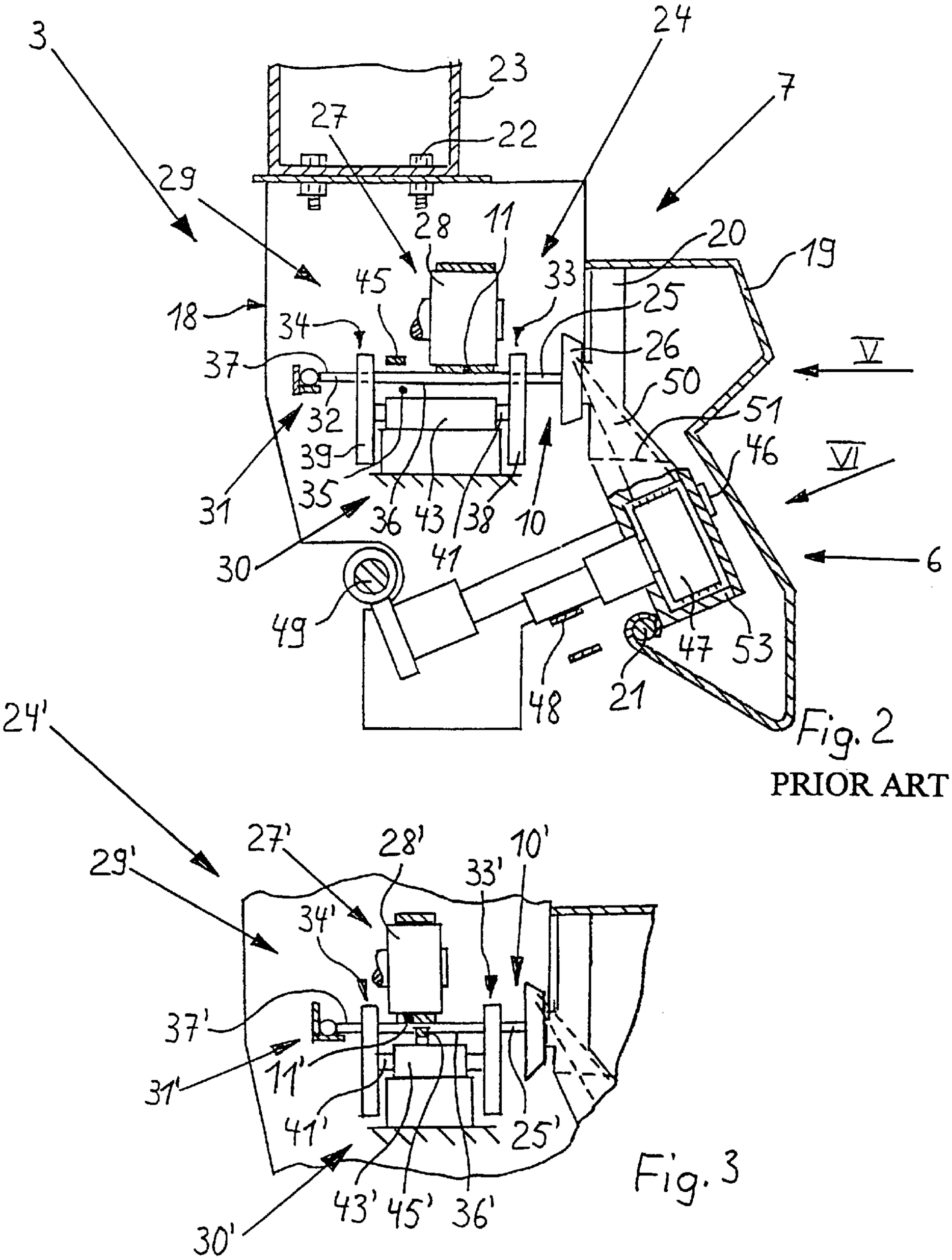


Fig. 2
PRIOR ART

Fig. 3

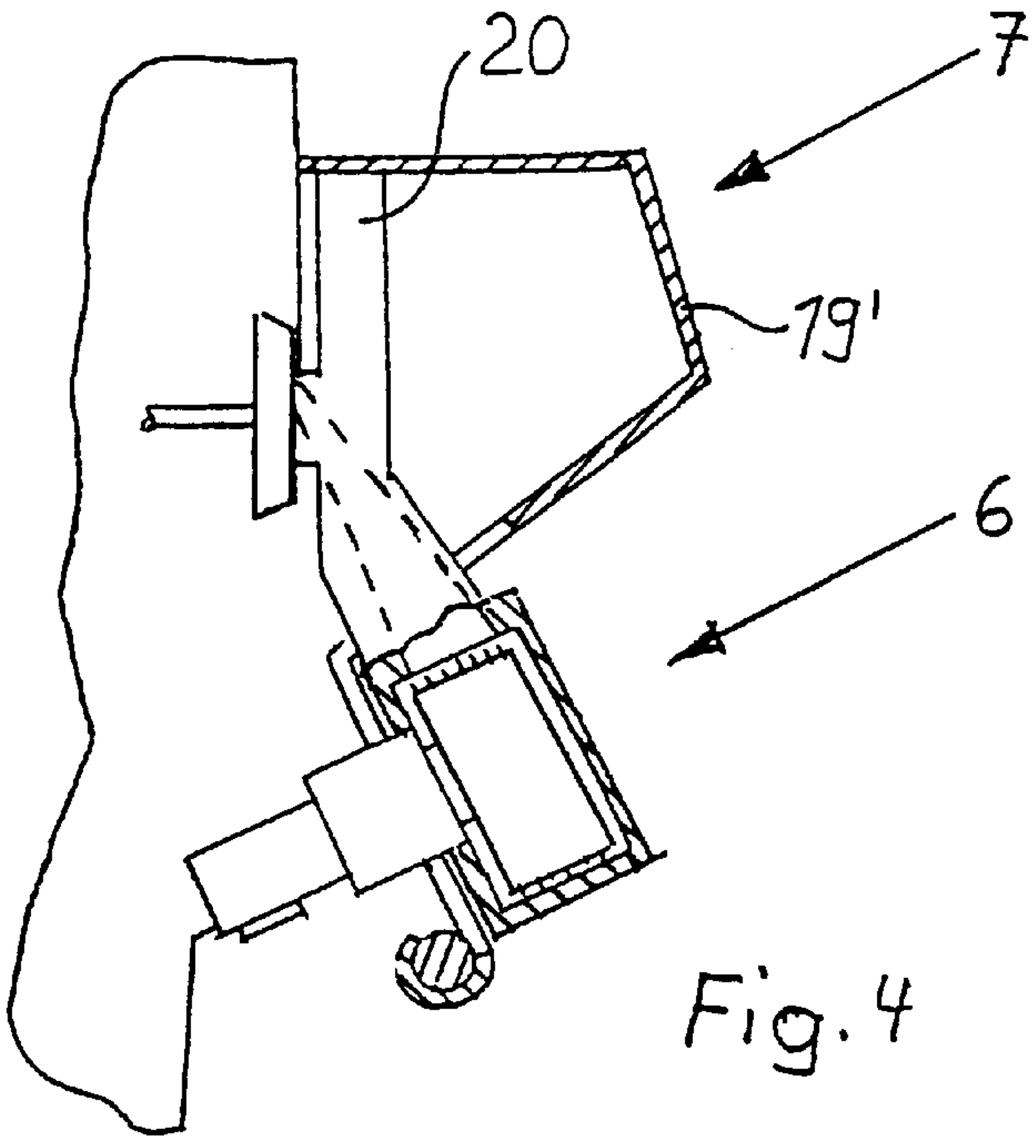


Fig. 4

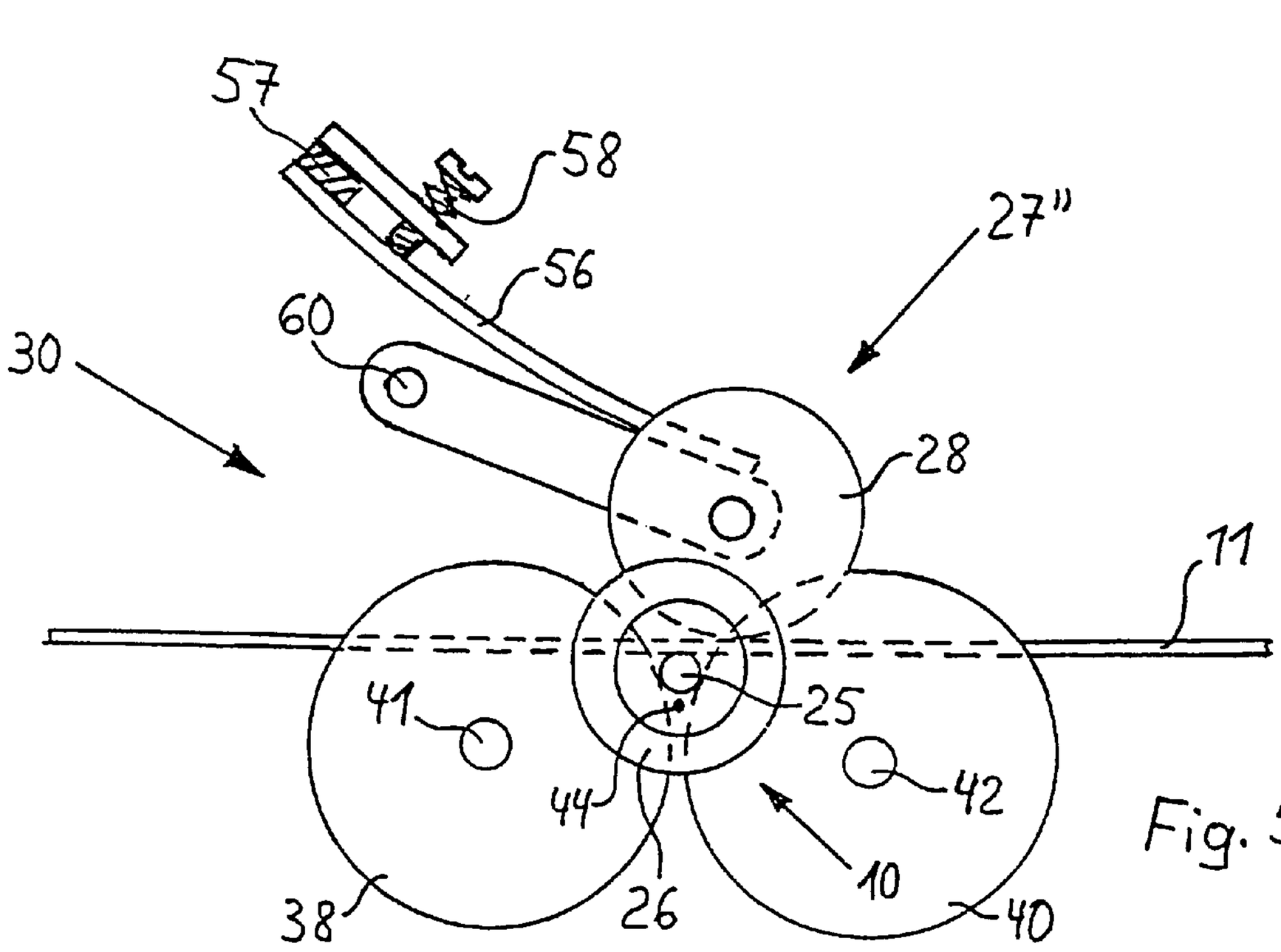


Fig. 5

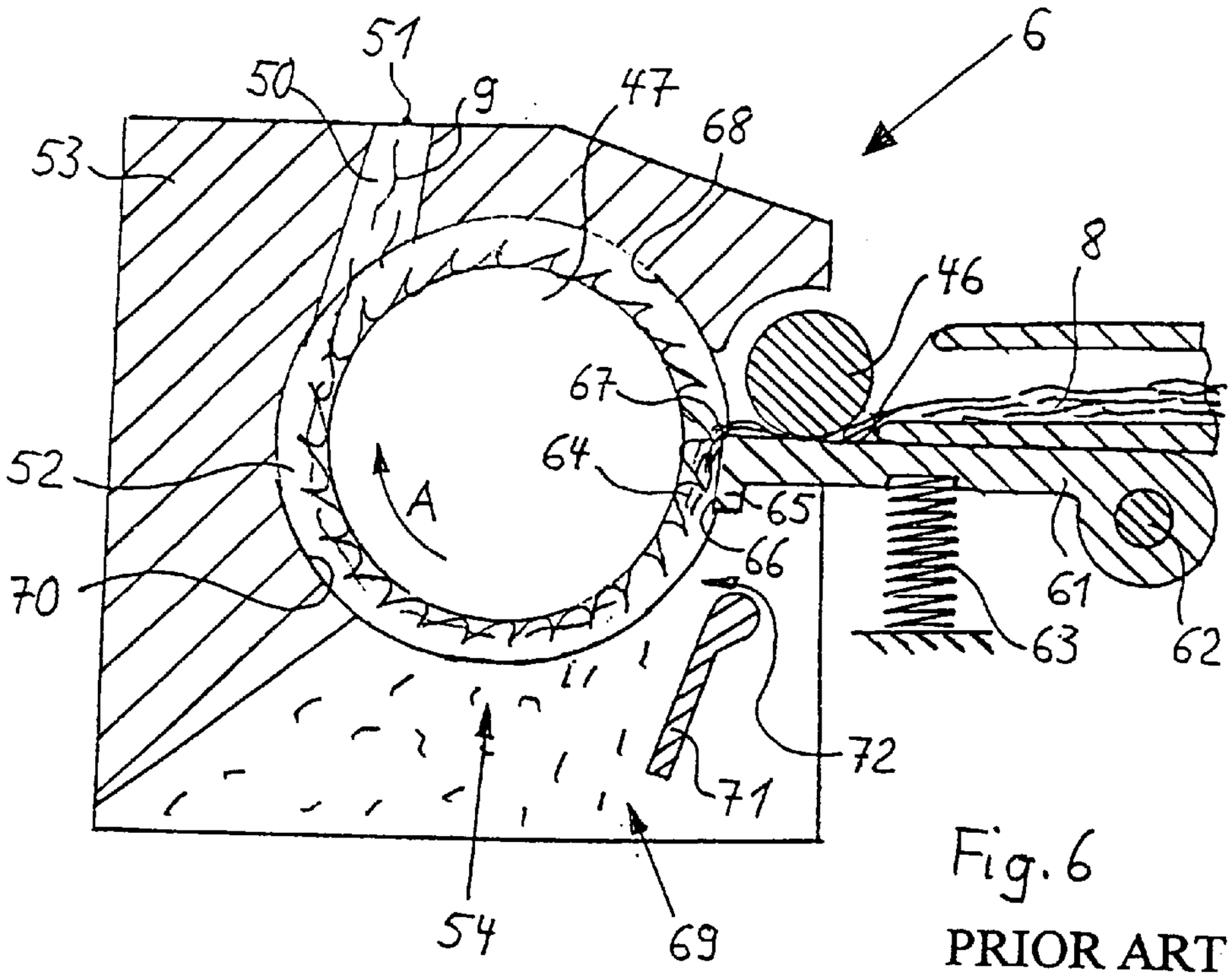


Fig. 6
PRIOR ART

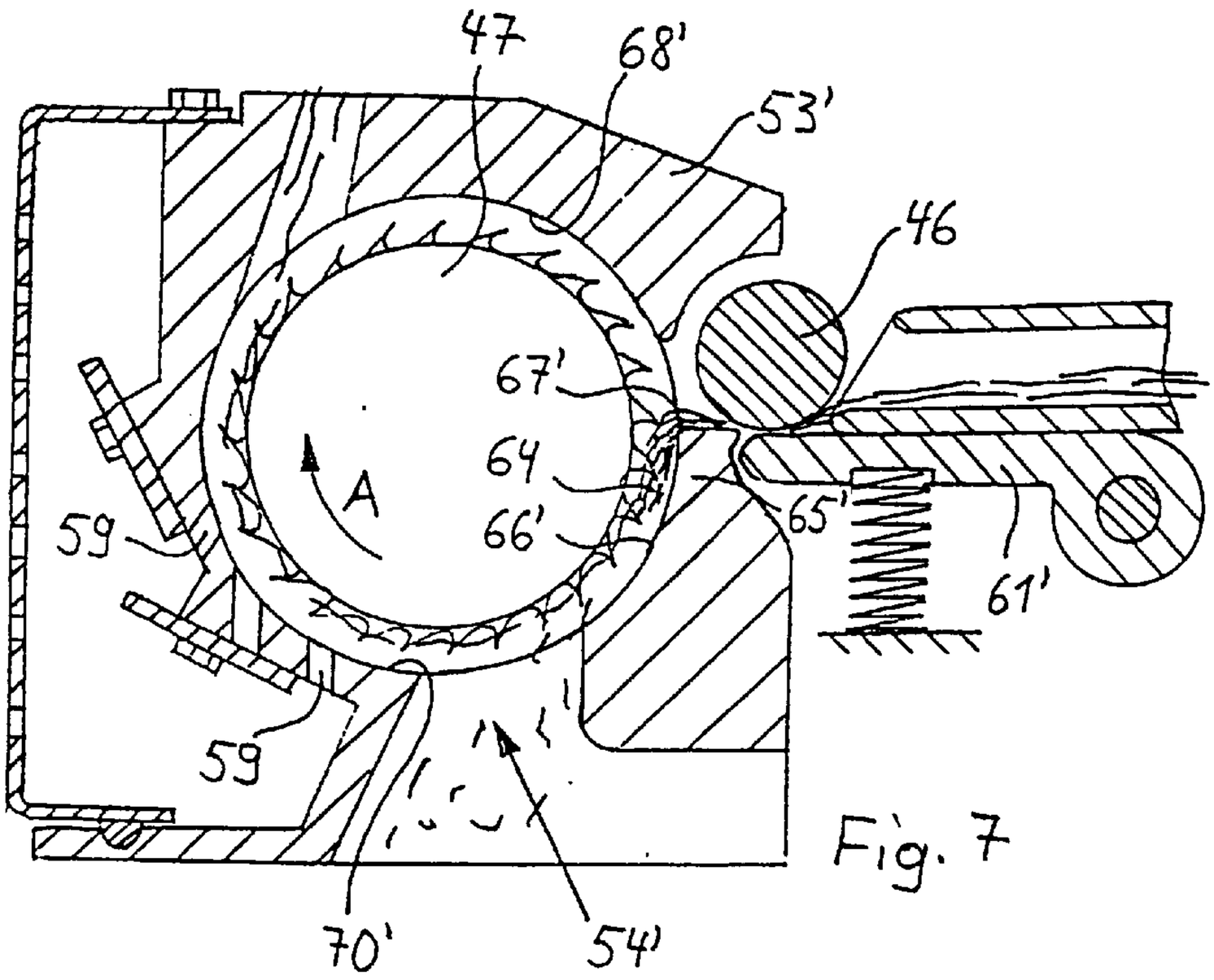


Fig. 7

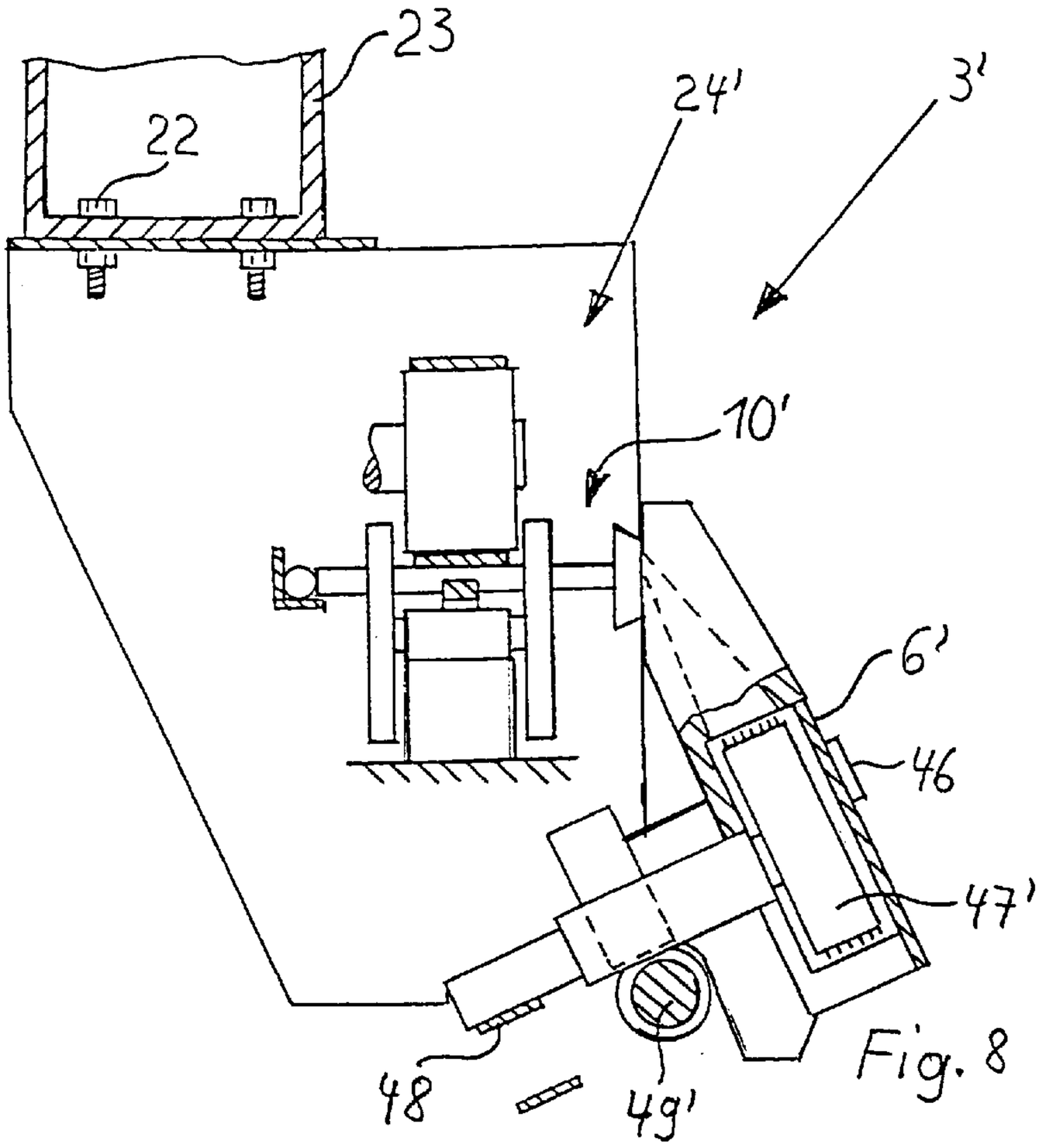


Fig. 8

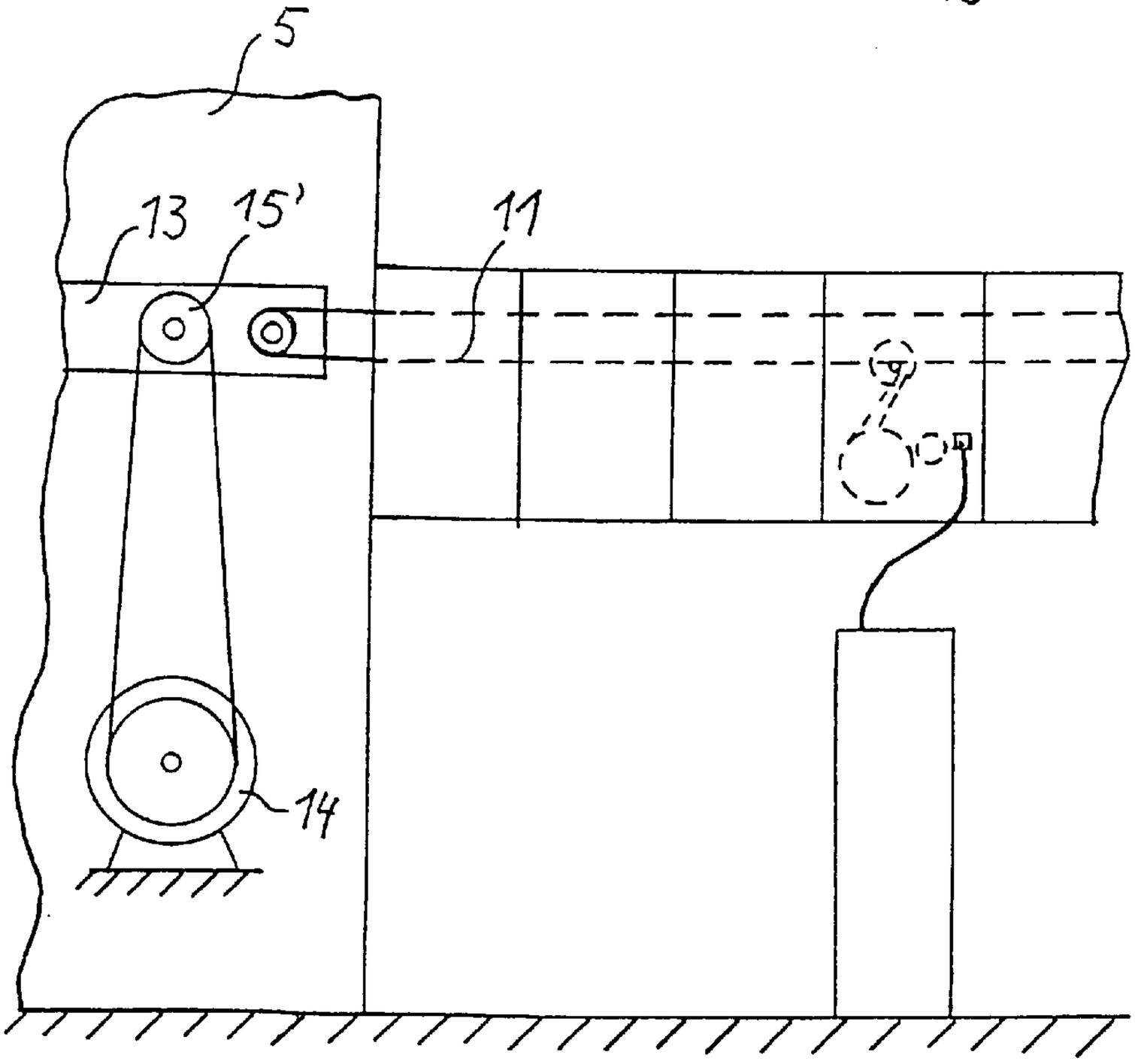


Fig. 9

PROCESS FOR MODERNIZING AN OPEN-END SPINNING MACHINE

BACKGROUND OF AND SUMMARY OF THE INVENTION

The present invention relates to a process for modernizing an open-end spinning machine, which comprises a plurality of adjacently arranged spinning aggregates, each of which consists essentially of an opening unit for opening a sliver fed to the spinning aggregate into single fibers, and of a rotor unit comprising a spinning rotor, the opening unit and rotor unit each comprising a plurality of components.

It is known from U.S. Pat. No. 4,150,462 that spinning machines are modernized by exchanging whole drafting units. Here, a plurality of new drafting units are affixed adjacent to one another to a joint longitudinal section. After the old drafting units of the spinning machine have been disassembled, a longitudinal section containing the new drafting units is assembled on the spinning machine undergoing modernization. The aim of these measures is to prevent assembly errors during modernization of the spinning machine.

The ideas disclosed in the above mentioned publication are only suitable to a certain extent for the modernization of the openend spinning machine. They are not suitable, for example, when a single spinning aggregate is to be disassembled.

It is an object of the present invention to demonstrate a method for modernizing an open-end spinning machine in which the efficiency of the open-end spinning machine is improved.

This object has been achieved in accordance with the present invention in that one of the components is replaced by at least one modernized component in such a way that the efficiency of the spinning aggregate is improved. Improved efficiency leads to better economic viability of the open-end spinning machine operational speeds.

As the amount of yarn which can be produced by an open-end spinning machine is proportional to the number of revolutions of the spinning rotor, an increase in the possible operational speed results directly in an increase in productivity and thus to improved efficiency.

It is hereby advantageous to assemble a modified radial bearing for the spinning rotor in such a way that the effective length of the rotor shaft between two bearing points of the radial bearing is shortened, or that the length of the rotor shaft projecting out over a bearing point is shortened. The length of the rotor shaft between the two bearing points can be shortened in that the radial bearing itself is modified. The length of the rotor shaft projecting out over a bearing point can for example be shortened in that the relative distance between the above mentioned bearing point and an axial bearing adjacent thereto is reduced. It has been shown that the critical speed of the spinning rotor is greatly dependent on the intermediate space, located between two bearing points, and spanned over by the rotor shaft, and on the length of the section piece of the rotor shaft projecting over the last bearing point. The shortened construction of the modified bearing unit means that the rotor shaft can be shortened. The critical speed of the spinning rotor can be increased without the diameter of the rotor shaft having to be enlarged.

In an advantageous embodiment, the pressure with which the drive belt is pressed against the rotor shaft can be regulated. The power consumption can hereby be reduced in that the pressure can be regulated to the relevant required minimum, thus improving the economic efficiency of the open-end spinning machine. The power saved can be applied elsewhere, for example for increasing the operational speed.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and features are given in the description of teh embodiments shown in the Figures. They show:

FIG. **1** is a longitudinal view of an unmodernized open-end spinning machine comprising a plurality of spinning aggregates;

FIG. **2** is an enlarged sectional view of an unmodernized spinning aggregate of FIG. **1** in arrow direction II of FIG. **1**;

FIG. **3** is a partial view of the spinning aggregate of FIG. **2** with a modified bearing unit for the spinning rotor;

FIG. **4** is a partial view of the spinning aggregate of FIG. **2** with a modified covering for the spinning aggregate;

FIG. **5** is a view of a bearing unit of the spinning aggregate of

FIG. **2** in arrow direction V of FIG. **2** with a modified tension element;

FIG. **6** is a sectional view of an unmodernized opening unit of the spinning aggregate of FIG. **2** in arrow direction VI of FIG. **2**;

FIG. **7** is a modified opening unit similar to that of FIG. **6**;

FIG. **8** is a sectional view of a complete modified spinning aggregate similar to the view in FIG. **2**;

FIG. **9** is a partial view of an open-end spinning machine of

FIG. **1** with a modified drive.

DETAILED DESCRIPTION OF THE DRAWINGS

The open-end spinning machine **1** shown in FIG. **1** comprises two longitudinal sides each with a row **2** of adjacently arranged spinning aggregates **3**. In FIG. **1**, only the row **2** of one longitudinal side of the open-end spinning machine **1** is shown.

The open-end spinning machine **1** ends with a machine head **4**, **5** at both its longitudinal ends. Pneumatic machine elements (not shown) are housed in the machine head **4**. The machine head **5** contains the central drive of the open-end spinning machine **1**. The central drive acts together with the spinning aggregates **3**.

The spinning aggregates **3** consist each essentially of an opening unit **6** and a rotor unit **7**. The opening unit **6** opens a sliver **8** which is fed to the spinning aggregate **3** into single fibers **9**, which are further transported to a spinning rotor **10** housed in the rotor unit **7**. The rotor unit **7** and the opening unit **6** each comprise a plurality of components. Furthermore, other components are housed in the spinning aggregate **3** which are not part of the opening unit **6** or the rotor unit **7**. These components will be described below.

The spinning rotors **10** of all the spinning aggregates **3** in the row **2** are set in rotation by a common drive belt **11**. The drive belt **11** is driven by a rotating drive shaft **12**, which is arranged in the machine head **5**. The rotating movement of the drive shaft **12** is derived from a main shaft (not shown) of the gear block **13**. The main shaft of the gear block **13** is driven by a motor **14**. A belt pulley **15** of the gear block **13** connected with the main shaft is connected by a toothed belt **16** with a belt pulley **17** of the motor **14**.

As already mentioned above and which can be seen from FIG. **2**, the spinning aggregate **3** comprises further compo-

nents in addition to the opening unit **6** and the rotor unit **7**. These further components include for example a frame **18** of the spinning aggregate **3** and a cover **19**. A rotor lid **20**, which is arranged at the rotor unit **7** and which covers a rotor housing (not shown) for the spinning rotor **10**, is affixed to the cover **19**. The cover **19** covers the opening unit **6** and the rotor unit **7** of the spinning aggregate **3** completely towards the control side. By swivelling the cover **19** around an axle in the form of a bar **21**, the opening unit **6** and the rotor unit **7** are made accessible for maintenance work, for example for cleaning. The rotor lid **20** is swivelled together with the cover **19**, whereby the rotor housing is opened. The spinning process is interrupted when the cover **19** is swivelled.

The opening unit **6** and the rotor unit **7** are affixed to the frame **18** of the spinning aggregate **3**. The frame **18** of the spinning aggregate **3**, consisting of a plurality of sheet metal parts, is affixed to a support **23** by means of screws **22**, which support **23** forms a part of the frame of the open-end spinning machine **1**. The support **23** extends in longitudinal direction of the open-end spinning machine **1** and supports a plurality of adjacently arranged spinning aggregates **3** of the row **2**.

Part of the components of the rotor unit **7** is formed by a drive **24** for the spinning rotor **10**, which consists of a rotor shaft **25** and a rotor cup **26**. The drive **24** is made up of a plurality of drive elements and the drive belt **11** mentioned above, which as a central drive element is arranged to a plurality of spinning aggregates **3**.

The drive **24** contains a tension element **27** comprising a tension pulley **28** which guides the drive belt **11** and presses it against the rotor shaft **25** during operation. The tension is essentially the same in every spinning aggregate **3** and cannot be regulated. Apart from the lack of regulating means, the tension element **27** corresponds to the modified tension element **27"** shown in FIG. **5**, which will be described below.

The drive **24** comprises a bearing unit **29** with a plurality of bearing elements for supporting the rotor shaft **25**. The bearing elements form a radial bearing **30** and an axial bearing **31**. During operation, the spinning rotor **10** is pressed against a supporting element of the axial bearing **31** with a free end **32** which faces away from the rotor cup **26**.

The radial bearing **30** comprises two bearing points **33**,**34**, which are spaced from one another in axial direction of the rotor shaft **25** and which form an intermediate space **35**. During operation, the rotor shaft **25** is supported by both bearing points **33**,**34** of the radial bearing **30**. The rotor shaft **25** hereby spans the intermediate space **35** with a first longitudinal section **36** and projects with a second longitudinal section **37** over the bearing point **34** facing the axial bearing **31**. The linear extension of the first longitudinal section **36** is determined by the distance between the two bearing points **33** and **34**. The linear extension of the second longitudinal section **37** is determined by the distance between the axial bearing **31** and the bearing point **34**.

The radial bearing **30** takes the form of a supporting disc bearing. This can be seen from FIG. **5**. The radial bearing **30** shown in FIG. **5** corresponds to the radial bearing shown in FIG. **2**.

As can be seen from FIGS. **2** and **5**, the supporting disc bearing comprises in a known way four supporting discs **38**,**39**,**40**, one of which is not shown in the Figures. The supporting disc **38** is hereby arranged on a common shaft **41** with the supporting disc **39**. In the same manner, the supporting disc **40** is arranged on a common shaft **42** with the supporting disc which is not shown. Both of the shafts **41** and **42** are arranged together on a bearing support **43** in such a way that the supporting disc **38** forms a wedge-shaped gap **44** with the supporting disc **40**, while the supporting disc **39** forms a wedge-shaped gap in the same way with the supporting disc which is not shown. The rotor shaft **25** is secured in its radial position by the pressure of the tension pulley **28**. Laterally to the tension pulley **28**, a rotor brake **45** is arranged, which comprises a braking body which can be disposed from above on the rotor shaft **25**.

The structure of the opening unit **6** can be seen from FIGS. **2** and **6**. The opening unit **6** comprises a feed roller **46** for feeding the sliver **8** and an opening roller **47** for opening the sliver **8** into single fibers **9**, which can be transported to the spinning rotor **10** by means of a fiber feed channel **50**. The fiber feed channel **50** is divided into two section pieces by a butt joint **51**, one of which section pieces is arranged to the rotor unit **7** and the other to the opening unit **6**.

As can be seen in particular from FIG. **6**, arranged at the feed roller **46** is a feed table **61**, which can be swivelled around an axle **62** arranged parallel to the feed roller **46** and which is weighted by a spring **63** in the direction of the feed roller **46**. The area of the feed table **61** disposed opposite the feed roller **46** forms with the feed roller **46** a nipping point for the single fibers **9** which are combed from the sliver **8**. The end of the sliver **8**, the so-called fiber beard **64**, is supported during combing by a fiber sliver support **65**, which is arranged at that end of the feed table **61** facing the opening roller **47**. The sliver support **65** comprises a guiding surface **66**, which extends approximately tangentially to the opening roller **47** and which graduates in a rounded deflecting edge **67** into the area of the feed table **61** facing the feed roller **46**.

The opening roller **47** is supported in an essentially cylindrical cavity **52** of a housing **53**. The section piece of the fiber feed channel **50** arranged at the opening unit **6** is housed in the housing **53**. The other section piece of the fiber feed channel **50** is housed in the rotor lid **20** mentioned above.

The essentially cylindrical cavity **52** of the housing **53** comprises a circumferential wall **68** which surrounds the opening roller **47**. The circumferential wall **68** comprises between the sliver support **65** and the fiber feed channel **50** a non-continuous area **69** and a continuous area **70**, which is adjacent to the non-continuous area **69** and extends to the fiber feed channel **50**. A wall **71** arranged at a distance to the opening roller **47** divides the non-continuous area **69** into an air-opening **72**, beginning with the end of the sliver support **65**, and an adjacent removal opening **54** in rotational direction A. The removal opening **54** serves to remove trash particles present in the sliver **8**. Air, necessary for the transport of the single fibers **9** by the fiber feed channel **50** to the spinning rotor **10** (not shown in FIG. **6**), is able to flow through the air opening **72** as a result of the suction effect coming from the fiber feed channel **50**. Air can also flow in through the removal opening **54**.

While the opening roller **47** is driven by a tangential belt **48** near the bar **21** which serves as a swivel axle, the feed roller **46** receives its drive, by way of a worm-wheel connection, from a drive shaft **49**, which is arranged at a distance from the bar **21** in the interior of the spinning aggregate **3** and which is arranged in the longitudinal direction of the machine.

The spinning aggregate **3** described above can be modernized in that components of the opening unit **6** or the rotor unit **7** or other components of the spinning aggregate **3** are replaced by modified components, which improve the

efficiency, that is, the economic efficiency or the yarn quality, of the open-end spinning machine **1**.

A first modernizing possibility is shown in FIG. **3**. The drive **24** of FIG. **2** is replaced by a modified drive **24'** in order to enable higher revolutions of the spinning rotor **10**. The entire bearing unit **29** is hereby disassembled and a modified bearing unit **29'** assembled. The tension element **27** is replaced by a modified tension element **27'**.

The modified bearing unit **29'** differs from the bearing unit **29** essentially in that the bearing points **33'** and **34'** of the radial bearing **30'** are in closer proximity to one another, and in that the axial bearing **31'** is arranged in closer proximity to the bearing point **34'** of the radial bearing **30'** facing thereto. The length of the first longitudinal section **36'** and the length of the second longitudinal section **37'** of the rotor shaft **25'** is thus shortened.

This results in the critical speed of the spinning rotor **10'** being increased, whereby higher operational speeds are possible. The shortening of the distance between the two bearing points **33'** and **34'** can be maintained among other things by the use of a narrower bearing support **43'** and shorter shafts **41'**. In place of the rotor break **45** of the FIG. **2**, a rotor brake **45'** in the form of a pincer break is applied, which acts underneath the tension pulley **28'**. The modified bearing unit **29'** can correspond in its construction to that described in U.S. Pat. No. 4,763,469.

The modified tension element **27'** comprises a narrower tension pulley **28'**, over which a narrower drive belt **11'** is guided. The use of a narrower drive belt **11'** results in a reduction in power consumption. Otherwise, the tension element **27'** corresponds to the tension element **27** in FIG. **2**. In an altered embodiment (not shown), the pressure can be reduced to a lower constant amount.

By applying the modified drive **24'** it is possible to operate the spinning rotors **10'** at significantly higher revolutions. The higher revolutions can be maintained by changing the central drive in the machine head **5**. This type of alteration is shown in FIG. **9**. As can be seen from FIG. **9**, the belt pulley **15** (see FIG. **1**) of the gear block **13** is replaced by a belt pulley **15'** with a smaller diameter. Alternatively, higher spinning rotor **10** speeds can be achieved by reducing the diameter of the rotor shaft **25**.

A further modernizing possibility is to replace components of the spinning aggregate **3**, which are not arranged at the opening unit **6** or the rotor unit **7**, with modified components. This variation is shown in FIG. **4**. Instead of the closed cover **19** of FIG. **2**, a cover **19'** is used which does not cover the opening unit **6**, thus making it accessible for a simple cleaning process by a maintenance device while the open-end spinning machine **1** is in operation. As the cover **19'** does not have to be swivelled in order for the maintenance device to gain access to the opening unit **6**, and the rotor housing is still covered by the rotor lid **20**, the cleaning of the opening unit **6** can be carried out without interrupting the spinning process.

A third variation for modernizing is shown in FIG. **5**. The tension element **27** is partly replaced by a modified tension element **27"**. As mentioned above, the radial bearing **30** in FIG. **5** otherwise corresponds to the radial bearing **30** of FIG. **2**. The tension element **27"** corresponds to a large extent to the tension element **27** of FIG. **2**.

The tension element **27"** comprises a tension pulley **28** which can be swivelled around a stationary axle **60**, which tension pulley **28** is pressed against the drive belt **11** by means of a leaf spring **56** in the same manner as in the embodiment shown in FIG. **2**. The leaf spring **56** is affixed to the frame **18** (not shown in FIG. **5**) of the spinning aggregate **3** by means of a holding device **57**. In contrast to the tension element **27** of FIG. **2**, in the modified tension element **27"** of FIG. **5** an adjusting screw **58** is provided which acts on the leaf spring **56** and with which the pressure can be regulated. It is hereby possible to reduce the pressure to the absolute minimum requirement and thus to reduce power consumption.

In an altered embodiment (not shown), the adjustable tension element **27"** can be applied in a drive which corresponds to the drive **24'** shown in FIG. **3**.

A fourth modernization possibility is shown in FIG. **7**. The housing **53** for the opening roller **47** is hereby replaced by a modified housing **53'**. In contrast to the housing **53** shown in FIG. **6**, one or more separate air openings **59** for guiding air into the fiber feed channel **50** are provided in addition to the removal opening **54'** for trash particles. The air openings **59** are arranged in an area **70'** of the circumferential wall **68'**, which area **70'** adjoins the removal opening **54'** in circumferential direction A of the opening roller **47**. By means of such a construction, which is described in the as yet unpublished German patent application 196 18 414.2, corresponding to U.S. Pat. No. 5,809,766 a reduction in trash deposits in the spinning rotor **10** can be achieved, which leads to a reduction in the number of end breaks and thus also to an increase in economic efficiency and an improvement in yarn quality.

In contrast to the embodiment shown in FIG. **6**, the sliver support **65'** is not arranged at the feed table **61'**, but rather is arranged in a stationary manner at the opening roller housing **53'**. The position of the sliver support **65'** including the guiding surface **66'** and the deflecting edge **67'** does not change, even when the feed table **61'** carries out compensatory movements when adapting to the fed sliver **8**. Thus it is ensured that the combing conditions are not altered. A construction of this type is described in principle in the U.S. Pat. No. 5,185,994.

A fifth modernization variation is shown in FIG. **8**. In place of the spinning aggregate **3** of FIG. **2**, an entire modified spinning aggregate **3'** is affixed to the support **23** of the frame of the open-end spinning machine **1**. As can be seen from FIG. **8**, the spinning aggregate **3'** comprises a drive **24'**, which corresponds essentially to the drive **24'** shown in FIG. **3** and which thus permits significantly higher revolutions of the spinning rotor **10'**. Further essential features of the spinning aggregate **3'** are described in U.S. Pat. No. 5,433,068, one feature being for example that the opening unit **6'** can be swivelled around the drive shaft **49'** of the feed roller **46**. To this end, the drive shaft **49'** is now arranged between the opening roller **47'** and its driving tangential belt **48**.

Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example, and is not to be taken by way of limitation. The spirit and scope of the present invention are to be limited only by the terms of the appended claims.

I claim:

1. A process for re-equipping and simultaneously modernizing an open-end rotor spinning machine, said machine having a plurality of adjacently arranged commonly driven spinning stations having components, said components comprising:

a spinning rotor supported on a spinning rotor shaft,

an opening unit for opening fiber slivers into single fibers and feeding them to the rotor, and

a rotor drive unit for rotatably driving the rotor shaft and rotor during spinning operations,

said process comprising removing old existing spinning stations and substituting new spinning stations having modified components operable to increase the spinning efficiency and rotor rotational speed of the respective spinning stations;

wherein said modified components have characteristics modified from said components of said old existing spinning stations in a new state.

2. A process according to claim **1**, wherein said spinning machine includes a plurality of said spinning stations on each of two oppositely facing sides of the machine, and

wherein said process comprises replacing all of said existing spinning stations with said new spinning stations.

3. A process according to claim **2**, wherein each of said rotor drive units includes a plurality of bearing elements which are disposed to rotatably support a respective rotor shaft which is drivingly engaged by a common drive belt for a plurality of said spinning stations at one side of the spinning machine, and

wherein said modified components of said new spinning stations include new bearing elements configured to increase the critical speed of the respective rotor shafts as compared to the critical speed of the respective rotor shafts of the existing spinning stations.

4. A process according to claim **3**, wherein said bearing elements at each spinning station include a first pair of disk members radially engageable at a first axial bearing location on a spinning station rotor shaft and a second pair of disk members radially engageable at a second axial bearing location on said spinning rotor shaft, and

wherein said new bearing elements of said new spinning stations are disposed so that the distance between the first and second axial bearing locations is reduced as compared to the corresponding distance of the existing spinning stations.

5. A process according to claim **4**, wherein tension means are provided to tension said drive belt against the respective rotor shafts, and

wherein said process further includes replacing said drive belt and tension means with a-modified drive belt and tension means.

6. A process according to claim **4**, wherein said opening units each includes an opening roller supported in an opening roller housing, and

wherein said modified components of said new spinning stations include new opening roller housings configured to reduce an amount of trash deposited in the respective rotors by the opening units as compared to the respective open units of the existing spinning stations.

7. A process according to claim **6**, wherein tension means are provided to tension said drive belt against the respective rotor shafts, and

wherein said process further includes replacing said drive belt and tension means with a modified drive belt and tension means.

8. A process according to claim **3**, wherein tension means are provided to tension said drive belt against the respective rotor shafts, and

wherein said process further includes replacing said drive belt and tension means with a modified drive belt and tension means.

9. A process according to claim **2**, wherein said opening units each includes an opening roller supported in an opening roller housing, and

wherein said modified components of said new spinning stations include new opening roller housings configured to reduce an amount of trash deposited in the respective rotors by the opening units as compared to the respective open units of the existing spinning stations.

10. A process according to claim **9**, wherein said new opening roller housings include a trash removal opening and at least one separate air opening disposed downstream of the trash removal opening in a travel direction of fibers on the opening roller, said at least one separate air opening providing guiding air to a fiber feed channel of said opening roller housing.

11. A process according to claim **10**, wherein said new opening roller housings include a trash removal opening and at least one separate air opening disposed downstream of the trash removal opening in a travel direction of fibers on the opening roller, said at least one separate air opening providing guiding air to a fiber feed channel of said opening roller housing.

12. A process according to claim **11**, wherein said spinning machine includes a plurality of said spinning stations on each of two oppositely facing sides of the machine, and

wherein said process comprises replacing all of said existing spinning stations with said new spinning stations.

13. A process according to claim **1**, wherein each of said rotor drive units includes a plurality of bearing elements which are disposed to rotatably support a respective rotor shaft which is drivingly engaged by a common drive belt for a plurality of said spinning stations, and

wherein said modified components of said new spinning stations include new bearing elements configured to increase the critical speed of the respective rotor shafts as compared to the critical speed of the respective rotor shafts of the existing spinning stations.

14. A process according to claim **13**, wherein said bearing elements at each spinning station include a first pair of disk members radially engageable at a first axial bearing location on a spinning station rotor shaft and a second pair of disk members radially engageable at a second axial bearing location on said spinning rotor shaft, and

wherein said new bearing elements of said new spinning stations are disposed so that the distance between the first and second axial bearing locations is reduced as compared to the corresponding distance of the existing spinning stations.

15. A process according to claim **13**, wherein tension means are provided to tension said drive belt against the respective rotor shafts, and

wherein said process further includes replacing said drive belt and tension means with a modified drive belt and tension means.

16. A process according to claim **1**, wherein said opening units each includes an opening roller supported in an opening roller housing, and

wherein said modified components of said new spinning stations include new opening roller housings configured to reduce an amount of trash deposited in the respective rotors by the opening units as compared to the respective open units of the existing spinning stations.

17. A process according to claim **16**, wherein tension means are provided to tension said drive belt against the respective rotor shafts, and

wherein said process further includes replacing said drive belt and tension means with a modified drive belt and tension means.

18. A process according to claim 16, wherein said new opening roller housings include a trash removal opening and at least one separate air opening disposed downstream of the trash removal opening in a travel direction of fibers on the opening roller, said at least one separate air opening providing guiding air to a fiber feed channel of said opening roller housing.

19. A process according to claim 18, wherein said existing opening units each include a sliver support table reaching into said opening roller housing to adjacent said opening roller and an inlet air opening disposed upstream of said trash removal opening and downstream of said sliver support table, and

wherein said new opening units include a sliver support table which is disposed outside the opening roller housing and operable to place a fiber sliver to be opened on a part of the opening roller housing.

20. A process according to claim 1, wherein the existing spinning stations each include a cover which faces and covers the spinning rotor and the opening unit, and

wherein the new spinning stations each include a cover which faces and covers the spinning rotor but does not cover the opening unit, whereby the opening unit is thereby accessible for cleaning without requiring movement of the cover.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,055,801
DATED : May 2, 2000
INVENTOR(S) : Stahlecker

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6,
Line 65, change "supported on" to -- having --.

Signed and Sealed this

Tenth Day of September, 2002

Attest:

JAMES E. ROGAN
Director of the United States Patent and Trademark Office

Attesting Officer